

Acanthocephala from Arabian Gulf Fishes off Kuwait, with Descriptions of *Neoechinorhynchus dimorphospinus* sp. n. (Neoechinorhynchidae), *Tegorhynchus holospinosus* sp. n. (Illiosentidae), *Micracanthorhynchina kuwaitensis* sp. n. (Rhadinorhynchidae), and *Slendrorhynchus breviclaviproboscis* gen. n., sp. n. (Diplosentidae); and Key to Species of the Genus *Micracanthorhynchina*

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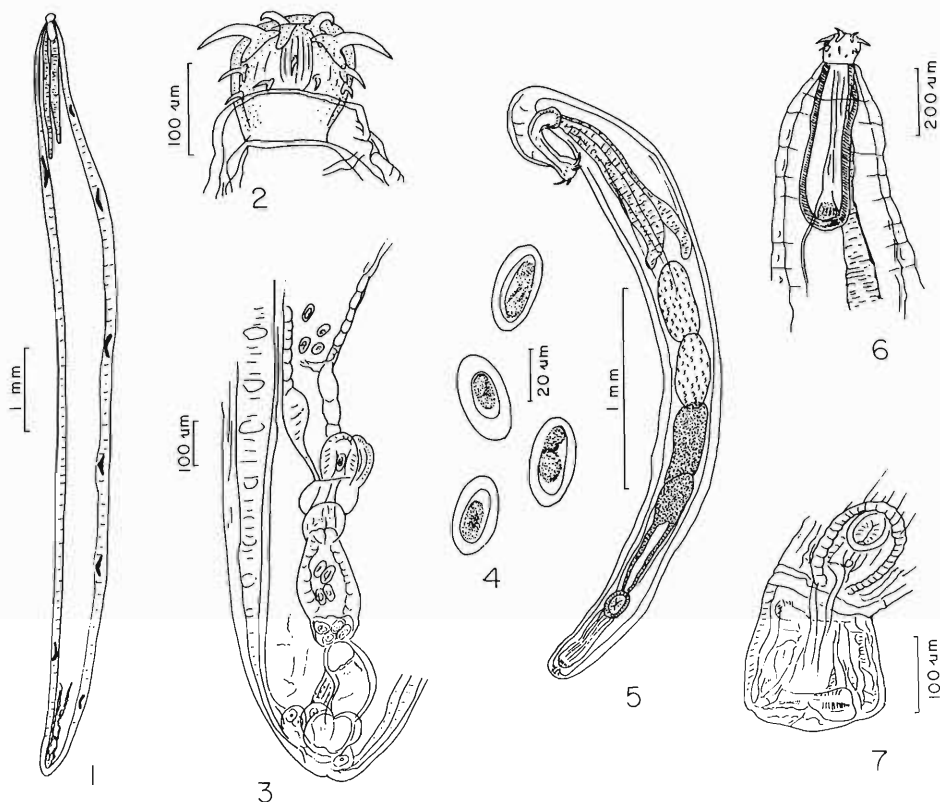
ABSTRACT: Five species of acanthocephalans were collected from 14 species of Arabian Gulf fishes off the coast of Kuwait between 1993 and 1995. They are the following. (1) *Neoechinorhynchus dimorphospinus* sp. n. (Neoechinorhynchidae) from *Allanetta forskali* (Ruppell, 1828), *Dorosoma nasus* (Bloch, 1795), and *Liza macrolepis* (Smith, 1849). It is distinguished from the only other species of *Neoechinorhynchus* Stiles and Hassall, 1905, from fish with unequal proboscis hooks in the anterior circle, *Neoechinorhynchus doryphorus* Van Cleave and Bangham, 1949, by having smaller terminal proboscis hooks and eggs. (2) *Tegorhynchus holospinosus* sp. n. (Illiosentidae) from *Leiognathus fasciatus* (Lacépède, 1798), *Leiognathus bindus* (Cuvier and Valenciennes, 1835), and *Pseudorhombus arsius* (Hamilton-Buchanan, 1827). It is the only species of the genus with cuticular spines covering almost the whole trunk. (3) *Micracanthorhynchina kuwaitensis* sp. n. (Rhadinorhynchidae) from *Hemiramphus marginatus* Forskal, 1775. It has the largest number of proboscis hooks per row (13–15) compared to all other species of the genus. A key separating the latter species from the other 6 valid species of the genus is included. (4) *Slendrorhynchus breviclaviproboscis* gen. n., sp. n. (Diplosentidae, Allorhadinorhynchinae), from *Lagocephalus lunaris* (Bloch and Schneider, 1801) and *Leiognathus bindus* (Cuvier and Valenciennes, 1835). It has trunk spines that cover almost the entire body and 4 cement glands. The other 2 monotypic genera of the subfamily, *Allorhadinorhynchus* Yamaguti, 1959, with 2 cement glands and *Golavanorhynchus* Noronha, Fabio, and Pinto, 1978, with 6 cement glands, have spines in the anterior part of the trunk only. The diagnosis of the subfamily Allorhadinorhynchinae is emended. (5) Juveniles of *Serrasentis sagittifer* (Rhadinorhynchidae) were recovered from the body cavity of 6 fish species; all are new host records.

KEY WORDS: marine Acanthocephala, Kuwait, new taxa, Arabian Gulf fishes.

Helminth parasites, especially acanthocephalans, of Arabian Gulf fishes are poorly known and their zoogeographical affinities to Red Sea fish parasites need to be studied. The present collection of acanthocephalans offers a unique opportunity to contribute significantly to our knowledge on these parasitic invertebrates including the description of 4 new species and 1 new genus. Most of the reported fish species have not been previously examined for parasites despite the fact that they have been taken from a commercially accessible source. This suggests that other (perhaps many) undescribed helminth species from Arabian Gulf fishes await discovery. Of the few helminthological reports from the same region, only Amin et al. (1984) reported on 3 acanthocephalan species from a considerably smaller collection.

Materials and Methods

Of 70 species obtained from a local fish market in Kuwait City between October 1992 and May 1995, 218 fishes were examined for parasites. Of these fishes, 13 species were infected with a total of 5 species of acanthocephalans between 1993 and 1995. Those 13 fish species (including family and number examined and dates parasites collected in parentheses) are as follows: *Allanetta forskali* (Ruppell, 1828), *Atherinidae* (6, June 1993); *Hemiramphus marginatus* Forskal, 1775, *Hemiramphidae* (7, June, July, October 1993); *Liza macrolepis* (Smith, 1849) *Mugilidae* (1, May 1995); *Mulloidichthys auriflamma* Forskal, 1775, *Mullidae* (11, June, July 1993); *Leiognathus bindus* (Cuvier and Valenciennes, 1835) *Leiognathidae* (11, March 1995); *Leiognathus fasciatus* (Lacépède, 1798), *Leiognathidae* (4, June 1993); *Lagocephalus lunaris* (Bloch and Schneider, 1801) *Tetraodontidae* (9, March 1995); *Dorosoma nasus* (Bloch, 1795), *Clupeidae* (11, October, December 1993, January 1994); *Acanthopagrus berda* (Forskal, 1775), *Sparidae* (8, December 1993);



Figures 1–7. *Neoechinorhynchus dimorphospinus* sp. n. 1. Allotype female. 2. Proboscis of a paratype female. 3. Reproductive system of a paratype female; note nucleated cells surrounding vagina. 4. Ripe eggs from the body cavity of female in Figure 3. 5. Holotype male. 6. Presoma of a paratype female showing the relationship between the proboscis and proboscis receptacle. 7. Bursa and cirrus of a paratype male.

Platycephalus indicus (Linnaeus, 1758) Platycephalidae (6, December 1993); *Upeneus sulphureus* Cuvier et Valenciennes, 1824, Mullidae (8, December 1993); *Pseudorhombus arsius* (Hamilton-Buchanan, 1827), Bothidae (18, February 1994, May 1995); and *Synaptura orientalis* (Bloch and Schneider, 1801), Soleidae (6, February 1994). Worms were fixed in 70% ethanol under slight coverglass pressure, stained in Mayer's acid carmine, dehydrated in ascending concentrations of ethanol, cleared in graded terpeneol–100% ethanol, and mounted in Canada balsam.

Measurements are in micrometers unless otherwise stated. The range is followed by mean values (in parentheses). Width measurements refer to maximum width. Body (=trunk) length does not include neck, proboscis, or male bursa. The male reproductive system occupies the area between the anterior margin of the anterior testis and the posterior end of the trunk. Eggs refer to fully developed shelled acanthors measured in situ through the body wall of females. Specimens are deposited in the U.S. National Parasite Collection (USNPC), Beltsville, Maryland (Dr. J. R. Lichtenfels, Curator).

Results

Neoechinorhynchus dimorphospinus sp. n. (Figs. 1–7)

Amin et al. (1984) reported 4 female specimens of an undescribed species of *Neoechinorhynchus* Stiles and Hassall, 1905, from *L. macrolepis* and *P. arsius*. This material was considered inadequate for description purposes. The present collection included males and more females sufficient to produce a complete description. One of the females from the Amin et al. (1984) report (USNPC No. 77427) is now designated as the allotype female of the new species. Female measurements include those from that earlier report.

Fifteen gravid females and 6 mature adult males (5 with sperm) were collected from 3 of 6 examined *A. forskali* (8 female, 1 male worms),

from 3 of 11 *D. nasus* (4 females, 5 males), and from 1 *L. macrolepis* (3 females).

Description

GENERAL: Neoechinorhynchidae, Neoechinorhynchinae; with characters of the genus. Shared structures larger in females than in males. Trunk cylindrical and widest in anterior half, particularly in younger adults but with more parallel sides in older and larger specimens; with 6 dorsal giant subcuticular nuclei and 2 ventral ones. Proboscis wider than long with the 2 lateral hooks in anterior ring longer and more vertically directed than the other 4 hooks in the same ring; all hooks rooted; roots with prominent anterior and posterior manubria; hooks in 2nd and 3rd rings progressively smaller. Proboscis receptacle considerably longer than proboscis with brain at its posterior end. Lemnisci near equal, considerably longer than proboscis receptacle.

MALES (based on 5 specimens): Trunk 2.970–6.660 (4.430) mm long by 330–660 (462) wide. Proboscis 65–117 (82) long by 91–130 (104) wide. Two lateral hooks in anterior ring 59–96 (79) long, others in same ring 51–86 (66) long; hooks in middle ring 30–49 (38) long, in posterior ring 23–36 (30) long. Proboscis receptacle 325–585 (442) long by 78–169 (121) wide. Lemnisci 1.300–1.950 (1.595) mm long by 91–130 (108) wide. Reproductive system in posterior $\frac{2}{3}$ of trunk: anterior testis 338–1,300 (682) long by 169–377 (273) wide, contiguous to and relatively larger than posterior testis 377–1,040 (630) long by 169–390 (243) wide; cement gland 143–182 (160) long by 104–143 (126) wide; cement reservoir prominent, overlaps cement gland posteriorly; 2 main cement ducts; Saeftigens pouch 312–585 (429) long by 143–390 (221) wide; bursa 195 long by 169 wide (one specimen).

FEMALES (based on 10 specimens): Trunk 3.135–15.411 (9.867) mm long by 330–880 (641) wide. Proboscis 86–117 (95) long by 96–156 (122) wide; 2 lateral hooks in anterior ring 59–105 (81) long, larger than others in same ring 51–92 (68) long; hooks in middle ring 26–53 (43) long, in posterior ring 26–40 (32) long. Proboscis receptacle 351–650 (483) long by 91–195 (138) wide. Lemnisci 2.240–2.730 (2.596) mm long by 143–195 (160) wide. Reproductive system robust, compact, and highly muscular with nucleated cells surrounding the vagina and at base of uterine bell. Ripe eggs oblong without prolongation of

fertilization membrane, 29–36 (32) long by 9–13 (10) wide.

Taxonomic Summary

TYPE HOST: *Dorosoma nasus* (Bloch, 1795) (Clupeidae).

OTHER HOSTS: *Allanetta forskali* (Ruppell, 1828) (Atherinidae), *Liza macrolepis* (Smith, 1849) (Mugilidae), and *Pseudorhombus arsius* (Hamilton-Buchanan, 1827) (Bothidae).

SITE OF INFECTION: Intestine.

TYPE LOCALITY: Arabian Gulf off the coast of Kuwait.

SPECIMENS DEPOSITED: USNPC No. 85944 (holotype male); No. 77427 (originally of Amin et al., 1984) (allotype female); No. 85945 (paratypes).

OTHER SPECIMENS EXAMINED: USNPC No. 77428 of Amin et al. (1984) and *Neoechinorhynchus doryphorus* Van Cleave and Bangham, 1949, type material (USNPC Nos. 37136, 37634, 65067, 37136.00, 37634.00, 65067.00).

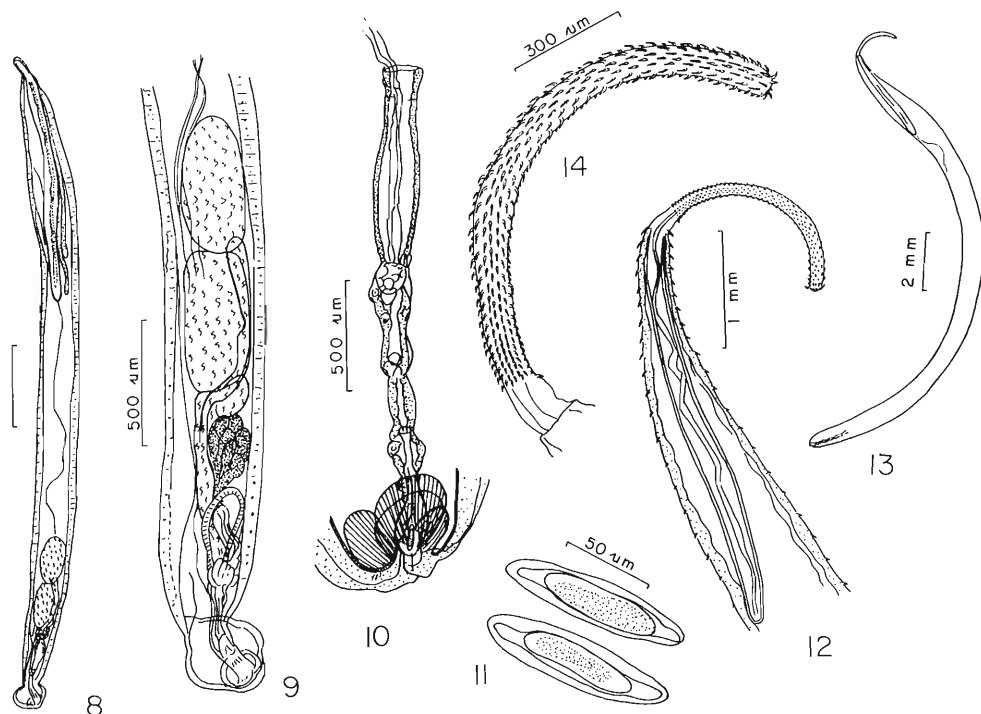
ETYMOLOGY: The new species is named for its dimorphic terminal proboscis hooks.

Remarks

Neoechinorhynchus doryphorus from a brackish water fish, *Jordanella floridae* Good and Bean, of the Englewood area in Florida is the only other fish acanthocephalan with lateral terminal proboscis hooks distinctly larger than dorsal and ventral hooks in the same ring. The 2 highly modified lateral terminal hooks of *N. doryphorus* are markedly larger (105–132) than those of *N. dimorphospinus* sp. n. Its (*N. doryphorus*) eggs are also considerably larger (48–55 by 14–16) and with a small rounded polar prolongation of the fertilization membrane. Van Cleave and Bangham (1949) included only 4 figures of 2 proboscides and 2 anterior hooks and provided a brief account of a few females' trunks, hooks, and egg measurements; 1 male allotype was included in the type material listed. Examination of the poorly processed and mounted (apparently in Permount) holotype female and other paratypes revealed no internal structures, rendering further comparison with our material impossible.

Tegorhynchus holospinosus sp. n. (Figs. 8–14)

The present material is recognized in the genus *Tegorhynchus* Van Cleave, 1921, as defined by



Figures 8–14. *Tegorhynchus holospinus* sp. n. 8. Holotype male; proboscis is retracted. 9. Details of the reproductive system of the holotype male. 10. Reproductive system of allotype female showing internal fan-shaped muscles at posterior end. 11. Ripe eggs in the body cavity of a paratype female. 12. Presoma of a paratype female showing the slender and long proboscis and proboscis receptacle. 13. Allotype female; lemnisci, trunk spines, and reproductive cells not shown. 14. A greater magnification of proboscis of female in Figure 12.

Bullock and Mateo (1970) to include its junior synonym *Illiosentis* Van Cleave and Lincicome, 1939. Reservations expressed by Leotta et al. (1982) regarding the internal fan-shaped muscles attached to the transverse cleft at the posterior end of female *Illiosentis* only have already been addressed by Bullock and Mateo (1970). Van Cleave and Lincicome (1939) previously indicated that the proboscis surface of both *Illiosentis* and *Tegorhynchus* have similarly “conspicuous investing cuticula,” and Van Cleave (1945) removed the genital spines from consideration as a generic character. This synonymy, recognized by Amin (1985), is considered valid and is retained herein.

Eighty-one specimens (38 females and 43 males) were collected from the intestines of 2 of 4 examined *L. fasciatus*, 2 of 18 *P. arsius*, and 2 of 11 *L. bindus*.

Description

GENERAL: Illiosentidae; with characters of the genus. Shared structures larger in females than

in males. Trunk cylindrical, long, and slender and covered totally with cuticular spines (except the genital orifice in females and posteriormost end of males behind level of Saeftigen’s pouch). Trunk spines in complete nonrandom rings very close together anteriorly and become progressively smaller in more widely spaced rings posteriorly. Proboscis bent ventrally, long and cylindrical, widest near its posterior end, where it joins the equally wide and slightly conical neck. Proboscis hooks in 14 longitudinal rows, larger ventrally than dorsally; largest hooks in anterior half of proboscis and become progressively smaller and more closely spaced posteriorly with posteriormost circle including only ventral enlarged modified hooks. Sensory papillae between 1st and 2nd complete posterior circles of proboscis hooks. Proboscis receptacle about twice as long as proboscis with brain at its anterior end. Lemnisci near equal, slightly shorter than proboscis receptacle.

MALES (based on 15 mature adults with sperm): Trunk 3.135–8.580 (6.135) mm long by 231–

561 (412) wide. Proboscis 1.155–1.485 (1.320) mm long by 99–132 (108) wide. Proboscis hooks 29–32 (31) per longitudinal row; largest dorsal hooks 32–43 (38) long by 5–6 (5) wide at base; largest ventral hooks 46–49 (48) long by 13–16 (14) wide at base; ventral hooks in posteriormost complete circle 16–23 (20) long; enlarged basal ventral hooks 23–33 (27) long. Proboscis receptacle 1.815–2.970 (2.396) mm long by 99–198 (142) wide. Lemnisci 1.419–2.145 (1.838) mm long by 49–99 (64) wide. Reproductive system at posterior end of trunk. Testes oblong, in tandem, contiguous; anterior testis 325–676 (546) long by 143–286 (214) wide; relatively smaller posterior testis 273–702 (455) long by 156–286 (214) wide; pear-shaped cement glands, 78–143 (124) long by 39–130 (76) wide. Saeftigen's pouch 221–481 (304) long by 91–208 (159) wide; well-developed sperm duct and vesicle; bursa 195–416 (326) long by 195–390 (299) wide. Gonopore terminal.

FEMALES (based on 18 gravid specimens):

Trunk 7.425–19.140 (13.084) mm long by 429–900 (643) wide. Proboscis 1.320–1.815 (1.563) mm long by 99–165 (128) wide. Proboscis hooks 36–40 (38) per longitudinal row. Largest dorsal hooks 33–47 (39) long by 5–6 (5) wide at base; largest ventral hooks 50–60 (53) by 16–20 (18) at base; ventral hooks in posteriormost complete circle 16–27 (22) long; enlarged basal ventral hooks 27–33 (29) long. Proboscis receptacle 2.475–3.630 (2.825) mm long by 132–231 (187) wide. Lemnisci 2.145–2.871 (2.535) mm long by 50–132 (80) wide. Reproductive system as in Figure 10. Eggs elliptical with polar prolongation of fertilization membrane, 93–105 (98) long by 20–25 (22) wide. Posterior end of trunk with internal fan-shaped muscles attached to transverse cleft associated with dorsoterminal gonopore.

Taxonomic Summary

TYPE HOST: *Pseudorhombus arsius* (Hamilton-Buchanan, 1827) (Bothidae).

OTHER HOSTS: *Leiognathus fasciatus* (Lacépède, 1798) and *Leiognathus bindus* (Cuvier and Valenciennes, 1835) (Leiognathidae).

SITE OF INFECTION: Intestine.

TYPE LOCALITY: Arabian Gulf off the coast of Kuwait.

SPECIMENS DEPOSITED: USNPC No. 85947 (holotype male); No. 85948 (allotype female); No. 85949 (paratypes).

ETYMOLOGY: The species is named for its ex-

tensive trunk spination covering almost the whole body of males and females.

Remarks

Pseudorhombus arsius becomes the type host because the best available male (holotype) was from that fish species; *L. fasciatus* was considerably more heavily and frequently infected.

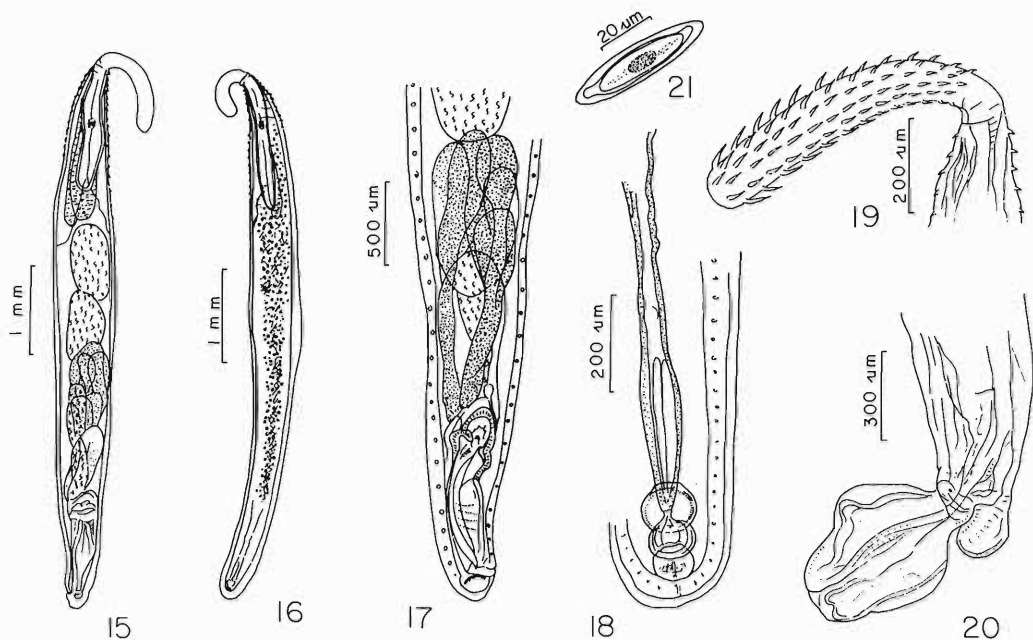
Tegorhynchus holospinosus sp. n. is distinguished from those of the genus *Dolffusentis* Golvan, 1969, by the absence of large separated crescent hooks at the base of the proboscis and the presence of internal fan-shaped muscles at the posterior end of females. It is the only species of the genus *Tegorhynchus* with cuticular spines covering almost the whole trunk of males and females. The other species of the genus have more limited trunk spination. These are *Tegorhynchus africanus* (Golvan, 1955) Amin, 1985; *Tegorhynchus brevis* Van Cleave, 1921; *Tegorhynchus cetratus* (Van Cleave, 1945) Bullock and Mateo, 1970; *Tegorhynchus edmondsi* (Golvan, 1960) Amin, 1985; *Tegorhynchus furcatus* (Van Cleave and Lincicome, 1939) Bullock and Mateo, 1970; and *Tegorhynchus multacanthus* (Mamaev, 1970) comb. n. (= *Illiosentis multacanthus* Mamaev, 1970). *Tegorhynchus pectinarius* Van Cleave, 1940, is believed to belong to another genus (see Bullock and Mateo, 1970). Of the preceding species, *T. multacanthus* has the largest distribution of cuticular spines covering the anterior half of males and females, with an additional group of spines near the posterior end of females (Mamaev, 1970). It is the closest species to *T. holospinosus* sp. n. anatomically but differs further from it by having more proboscis hooks per row (43–48 that may reach 61 ventrally or 65 dorsally) and smaller eggs (70–73 by 14–15).

Micracanthorhynchina kuwaitensis sp. n. (Figs. 15–21)

Twenty-four specimens (12 males, 12 females) were collected from 4 of 7 examined *H. marginatus*.

Description

GENERAL: Rhadinorhynchidae, Gorgorhynchinae; with characters of the genus. Shared structures larger in females than in males. Trunk cylindrical, of medium length, cigar-shaped, slightly wider at middle and gradually tapering toward blunt extremities; with pronounced subcuticular nuclei throughout its length at regular intervals; and with anterior trunk spines forming



Figures 15–21. *Micracanthorhynchina kuwaitensis* sp. n. 15. Holotype male. 16. Allotype female. 17. Reproductive system of a paratype male; sperm duct overlaps the portion of Saeffigen's pouch between cement ducts. 18. Reproductive system of the allotype female in Figure 16. 19. Proboscis of a paratype male. 20. Subterminal gonopore and bursa of a paratype male. 21. A ripe egg from the body cavity of a paratype female.

complete rings anteriorly then extending posteriorly only on the ventral side up to the level of the posterior end of the proboscis receptacle. Proboscis bent ventrally, mildly club-shaped and of medium length. Proboscis hooks slender in 12 longitudinal rows of 13–15 (14) hooks each that are not dorsoventrally differentiated; hooks largest near middle of proboscis and progressively decrease in size posteriorly to become small spines; roots simple with anterior manubria. Prominent conical neck. Proboscis receptacle extends into neck to base of proboscis, slightly longer than proboscis, and with brain near its middle. Lemnisci plump and somewhat longer than proboscis receptacle.

MALES (based on 10 mature adults with sperm):

Trunk 3.465–5.280 (4.364) mm long by 462–792 (600) wide, with cuticular spines in 14–18 (16) rings including 8–12 (11) anterior complete ones. Proboscis 650–858 (749) long by 130–208 (167) wide. Largest proboscis hooks 66–76 (70) long. Proboscis receptacle 780–1,235 (993) long by 130–208 (176) wide. Lemnisci almost reaching anterior testis, 910–1,430 (1,250) long by 117–260 (173) wide. Reproductive system in poste-

rior $\frac{2}{3}$ – $\frac{3}{4}$ of body; testes oblong-ovoid, in tandem contiguous; anterior testis 455–715 (598) long by 221–390 (289) wide; posterior testis about equal in size, 364–988 (614) long by 221–429 (320) wide. Cement glands large 260–650 (474) long by 130–364 (203) wide, in 2 clusters each with a long duct; gonopore subterminal; bursa (in 1 specimen) 532 long by 420 wide.

FEMALES (based on 9 gravid specimens):

Trunk 3.960–7.194 (5.709) mm long by 462–924 (590) wide with spines in 18–22 (19) rings including 10–15 (12) anterior complete ones. Proboscis 650–858 (762) long by 169–208 (185) wide. Largest proboscis hooks 69–79 (73) long. Proboscis receptacle 663–1,430 (1,074) long by 143–195 (169) wide. Lemnisci 1.235–1.755 (1.495) mm long by 117–260 (188) wide. Reproductive system highly muscular with terminal gonopore. Eggs elliptical with polar prolongation of fertilization membrane 49–53 (50) long by 13–17 (16) wide.

Taxonomic Summary

TYPE HOST: *Hemiramphus marginatus* Forskal, 1775 (Hemiramphidae).

SITE OF INFECTION: Intestine.

TYPE LOCALITY: Arabian Gulf off the coast of Kuwait.

SPECIMENS DEPOSITED: USNPC No. 85950 (holotype male); No. 85951 (allotype female); No. 85952 (paratypes).

ETYMOLOGY: The new species is named for its type locality.

Remarks

The new species is distinguished from all other members of the genus *Micracanthorhynchina* Strand, 1936 (= *Micracanthocephalus* Harada, 1938) by proboscis armature (with largest number of proboscis hooks per row: 13–15), among other features. The following key distinguishes the new species from the other 6 valid species of the genus. These are *Micracanthorhynchina cynoglossi* Wang, 1980; *Micracanthorhynchina dakusuiensis* (Harada, 1938) Ward, 1951; *Micracanthorhynchina hemiculturus* Demshin, 1965; *Micracanthorhynchina hemirhamphi* (Baylis, 1944) Ward, 1951 (= *Bolbosentis sajori* Belous, 1952; *Micracanthorhynchina sajori* (Belous, 1952) Golvan, 1969); *Micracanthorhynchina laterolabracis* Wang, 1980; and *Micracanthorhynchina motomuri* (Harada, 1938) Ward, 1951. Two other species are considered invalid and are not included in the key. These are (1) *Micracanthorhynchina segmentata* (Yamaguti, 1959) Araki and Machida, 1987 (= *Allorhadinorhynchus segmentatus* Yamaguti, 1959), and (2) *Micracanthorhynchina indica* Farooqi, 1980, which was only reported once in the Third National Congress of Parasitology meeting at Haryana Agricultural University, Hissar, India (24–26 April 1980); the abstract (Farooqi, 1980) included only the name of the species. Attempts to obtain more information from the author were unsuccessful. This species will have to be regarded as invalid until a formal and complete description is published, including a designation of type material deposited at a recognized institute or museum.

Key to Species of *Micracanthorhynchina*

1. Proboscis with 14 longitudinal rows of hooks 2
Proboscis with 12 longitudinal rows of hooks 3
2. Lemnisci about as long as proboscis receptacle;
testes small in posterior half of trunk *M. cynoglossi*
- Lemnisci longer than proboscis receptacle; testes large in middle of trunk *M. lateolabracis*

3. Proboscis hooks 13–15 per row *M. kuwaitensis* sp. n.
Proboscis hooks fewer than 13 per row 4
4. Largest proboscis hooks reaching 120 long anteriorly *M. hemirhamphi*
Largest proboscis hooks considerably shorter 5
5. Proboscis hooks 12 per row *M. hemiculturus*
Proboscis hooks 8 or 9 per row 6
6. Small worms: males 1.6–3.5 by 0.5 mm, females 4.5 by 0.6 mm; with 10–11 dorsal and 18–22 ventral rings of trunk spines; eggs 40 by 16 *M. motomurai*
Larger worms: males 4.0 by 0.8 mm, females 7.6 by 1.3 mm; with 9 dorsal and 18 ventral rings of trunk spines; eggs 63 by 16 *M. dakusuiensis*

Thirty-nine specimens (17 females and 22 males) of a new diplosentid genus were collected from the intestines of 2 of 11 *L. bindus* (17 females, 20 males) and 2 of 9 *L. lunaris* (2 males). The 2 *L. bindus* specimens were also concurrently infected with 6 male and 2 female *T. holospinus* sp. n. (earlier).

Slendrorhynchus gen. n.

Diagnosis

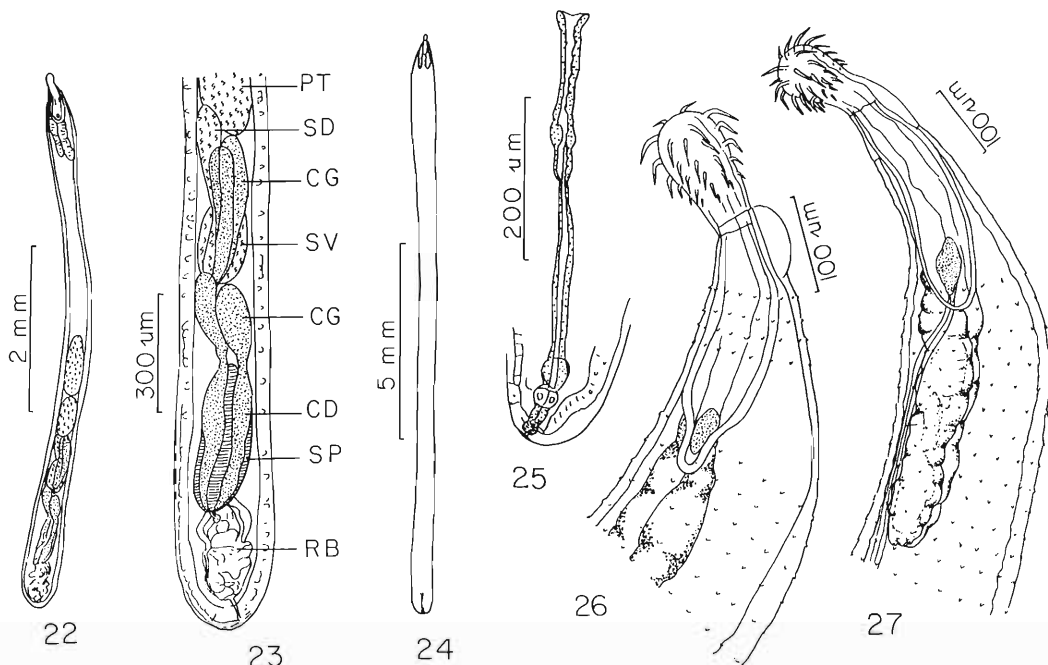
Diplosentidae, Allorhadinorhynchinae. Trunk long and slender, armed with many spines; developed spines in males in a few anterior circles separated from posterior extensive field of many circles of spines, usually with a spine free zone at the level of proboscis receptacle. In females, spines in anterior circles are vestigial or absent and may not be separated from posterior developed ones. Proboscis short and claviform; hooks few with simple roots. Proboscis receptacle about twice as long as proboscis with brain at its base. Lemnisci markedly longer than proboscis receptacle. Male reproductive system in posterior half of trunk; testes oblong, contiguous; cement glands 4; seminal vesicle, cement ducts, and Saeftigen's pouch prominent. Eggs fusiform with polar prolongation of fertilization membrane or with rounded ends. Gonopore nearly terminal.

TYPE SPECIES: *Slendrorhynchus breviclaviproboscis* sp. n.

Slendrorhynchus breviclaviproboscis sp. n. (Figs. 22–32)

Description

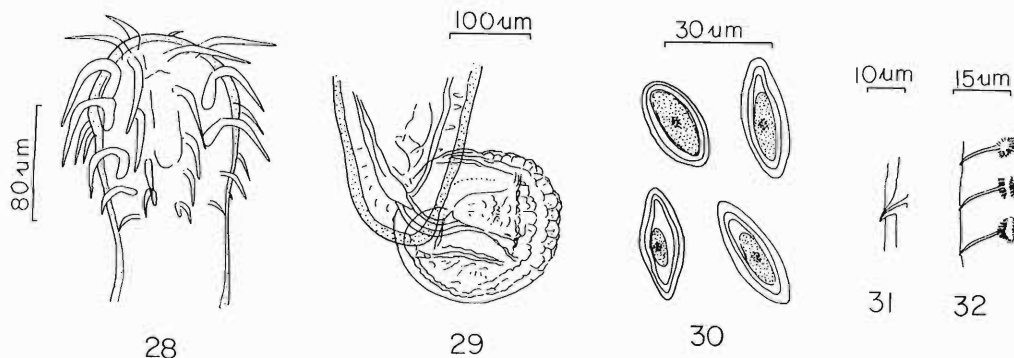
GENERAL: With characters of the genus. Shared structures larger in females than in males. Trunk almost uniformly cylindrical, very long



Figures 22–27. *Slendrorhynchus breviclaviproboscis* gen. n., sp. n. 22. Holotype male; proboscis retracted. 23. Reproductive system of holotype male. CD = Cement duct, CG = cement gland, PT = posterior testis, RB = retracted bursa, SD = sperm duct, SP = Saeftigen's pouch, SV = seminal vesicle. 24. A paratype female showing slender body form. 25. Reproductive system of a paratype female. 26. Anterior part of a paratype male showing anterior and portion of posterior circles of developed trunk spines. 27. Anterior part of a paratype female showing a few anterior circles of posterior trunk spines and barely visible cuticular projections more anteriorly. Trunk spines not shown in Figures 22–24. Body wall nuclei not shown in all figures.

and slender particularly in females; slightly wider at posterior end but some large gravid females may be widest near anterior end. Body wall with many small round-ovoid nuclei dispersed

throughout its length. Subcuticular area at anterior end of trunk, however, is clear and delimited from the rest of nucleated body wall to produce a collar-like structure that may become en-



Figures 28–32. *Slendrorhynchus breviclaviproboscis* gen. n., sp. n. 28. Proboscis of a paratype female. 29. Bursa of a paratype male. 30. Eggs. 31. A trunk spine from the posterior field of a male. 32. Trunk spines with proximal branched ends from the posterior field of a female.

larged dorsally into a hump. Developed trunk spines in circles extend from anterior end of trunk to level of posterior end of Saeftigen's pouch in males and shortly anterior to uterine bell in females. Pattern of anteriormost circles of developed spines variable. Those in first 4 circles in males are minute and separated from posterior circles of spines usually with a spine-free area at level of posterior half of proboscis receptacle. In females, fields of trunk spines may not be separated and spines of up to 8 or 9 anteriormost circles (level of whole length of proboscis receptacle) may be rudimentary, replaced by slightly pointed cuticular bumps, or completely absent. Anterior and posterior fields of trunk spines in males may rarely be bridged (more visible ventrally) with vestigial elements or cuticular bumps. Developed spines largest anteriorly but become progressively smaller as the circles become more widely spaced posteriorly. Posterior spines may have starlike-dendritic projections at their proximal end in some but not all females. Anterior end of trunk often bent ventrally. Proboscis short and claviform with 11 longitudinal rows of 5 slender hooks each; hooks not dorsoventrally differentiated, longest anteriorly and become progressively smaller posteriorly. Roots simple, unbranched, and directed more or less posteriorly. Neck prominent; slightly shorter than proboscis and narrowing posteriorly. Proboscis receptacle 2–3 times as long as proboscis with large brain at its base. Lemnisci near equal, about twice as long as proboscis receptacle. Posterior end of trunk bluntly rounded with gonopore ventroterminal.

MALES (based on 15 mature adults with sperm): Trunk 5.151–7.424 (6.355) mm long by 212–394 (314) wide with 2 fields of spines. Largest trunk spines 9–15 long. Proboscis 100–130 (111) long by 61–85 (75) wide. Longest anteriormost proboscis hooks 61–81 (73) long. Proboscis receptacle 231–277 (258) long by 77–92 (85) wide. Lemnisci 369–646 (506) long by 38–77 (56) wide. Reproductive system in posterior half of trunk. Testes oblong, in tandem, usually contiguous; anterior testis 385–1000 (554) long by 100–154 (129) wide; slightly shorter posterior testis 330–654 (480) long by 100–177 (132) wide. Four well-developed claviform-fusiform cement glands, each 169–231 (200) long by 54–92 (71) wide, arranged in 2 pairs, with long cement ducts emptying at base of prominent Saeftigen's pouch 231–385 (304) long by 77–138 (98) wide. Sperm duct and seminal vesicle well developed. Bursa 123–

230 (194) long by 154–230 (196) wide, with scalloped posterior margin.

FEMALES (based on 8 gravid females): Trunk 12.424–20.303 (15.035) mm long by 303–484 (404) wide. Largest spines 15–18 long. Proboscis 100–123 (111) long by 85–92 (87) wide. Longest anteriormost proboscis hooks 70–91 (79) long. Proboscis receptacle 246–369 (300) long by 77–100 (86) wide. Lemnisci 615–669 (646) long by 77–85 (80) wide. Reproductive system as in Figure 25. Eggs fusiform with polar prolongation of fertilization membrane but sometimes with rounded ends, 24–33 (30) long by 15–18 (16) wide.

Taxonomic Summary

TYPE HOST: *Lagocephalus lunaris* (Block and Schneider, 1801) (Tetraodontidae).

OTHER HOST: *Leiognathus bindus* (Cuvier and Valenciennes, 1835) (Leiognathidae).

SITE OF INFECTION: Intestine.

TYPE LOCALITY: Arabian Gulf off the coast of Kuwait.

SPECIMENS DEPOSITED: USNPC No. 85953 (holotype male), No. 85954 (allotype female), No. 85955 (paratypes).

ETYMOLOGY: The new genus is named for its long and slender trunk and the specific name for the size and shape of the proboscis.

Remarks

Slendrorhynchus gen. n. is unique among the palaeacanthocephalans for the combination of its long and slender trunk, pattern and distribution of trunk spines, and short proboscis with few hooks. It is herein assigned to the family Diplosentidae Tubangui and Masilungan, 1937, and subfamily Allorhadinorhynchinae Golvan, 1969. Members of Allorhadinorhynchinae are armed with trunk spines, whereas those of the other subfamily, Diplosentinae Golvan, 1969, are unarmed. *Slendrorhynchus* gen. n. appears to have been originally (evolutionary) armed with 1 continuous field of trunk spines extending from the anterior end of the trunk to near its posterior end in both sexes, as suggested by the occasional presence of reduced-vestigial spine elements or corresponding cuticular bumps in "spine-free" areas interrupting the continuity of this field in some individual females (anteriorly) or males (between anterior and posterior circles of developed spines). This one field proposition brings the diagnosis of the new genus to agreement with that of the subfamily Allorhadinorhynchinae: "Diplosenti-

dae dont le tronc est orne, dan sa partie anterieure, d'un seul champ d'epines cuticulaires" (Golvan, 1969, p. 149). However, the subfamily diagnosis needs to be emended to include genera with cuticular spines not restricted to the anterior part of the trunk as follows: Diplosentidae with trunk anteriorly to entirely spined; some spines may be secondarily reduced or absent.

Slendrorhynchus gen. n. is distinguished from the 2 other monotypic genera of Allorhadinorhynchinae as follows. *Allorhadinorhynchus* has only anterior trunk spines, brain at middle of proboscis receptacle, lemnisci shorter than receptacle, and 2 cement glands. *Golvanorhynchus* has only anterior and irregularly distributed trunk spines, long proboscis, lemnisci about as long as proboscis receptacle, and 6 cement glands.

Serrasentis sagittifer

(Linton, 1889) Van Cleave, 1923

The intestinal mesenteries of 6 species of fish were infected with a total of 18 encysted juveniles of *S. sagittifer*. These are *A. berda* (1 of 8 examined fish was infected with 1 worm [$\frac{1}{8}$, 1]), *M. auriflamma* ($\frac{2}{11}$, 2), *P. indicus* ($\frac{1}{6}$, 1), *P. arsius* ($\frac{1}{4}$, 8), *S. orientalis* ($\frac{1}{6}$, 1), and *U. sulphureus* ($\frac{1}{8}$, 5). All fish species appear to represent new host records. The general anatomy and measurements were comparable to those reported by Amin et al. (1984) from 5 additional fish species in the same waters.

Acknowledgments

The authors would like to acknowledge Dr. Brent B. Nickol, University of Nebraska-Lincoln, for kindly reviewing the manuscript and Dr. Salem Al-Mohanna, University of Kuwait, for helping with fish identification. Publication

was supported in part by the Brayton H. Ransom Memorial Trust Fund.

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